

An aerial photograph of a large, multi-lane highway bridge spanning a wide river. The bridge is filled with traffic, including numerous semi-trucks and cars. In the background, a city skyline with various buildings is visible. An orange banner is overlaid on the left side of the image.

PIONEERING LOCATION SOLUTIONS FOR A SAFER WORLD

A small, square inset image with a white border, showing a close-up view of a highway interchange with multiple lanes and overpasses.

TruePosition:
U-TDOA and Emergency Call Location

What is U-TDOA?



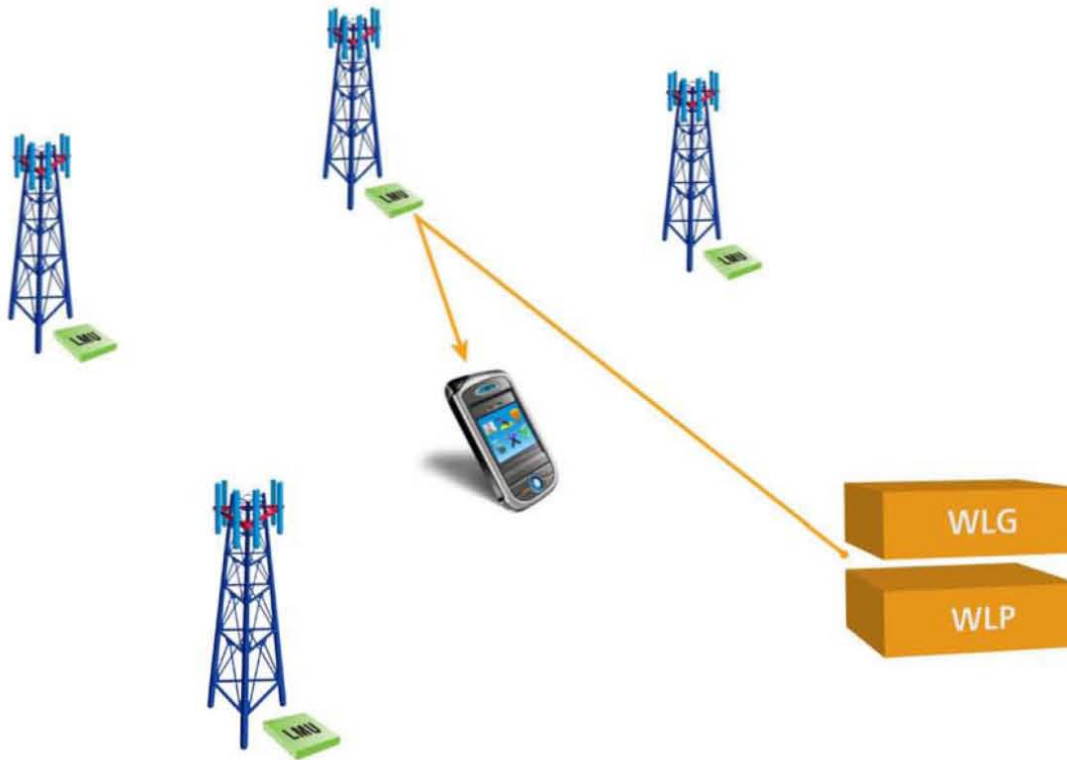
- U-TDOA stands for Uplink Time Difference of Arrival
- It is a wireless location technique that compares the time difference of mobile phone signals as they reach multiple location measurement units (LMUs)

How Does U-TDOA Work?



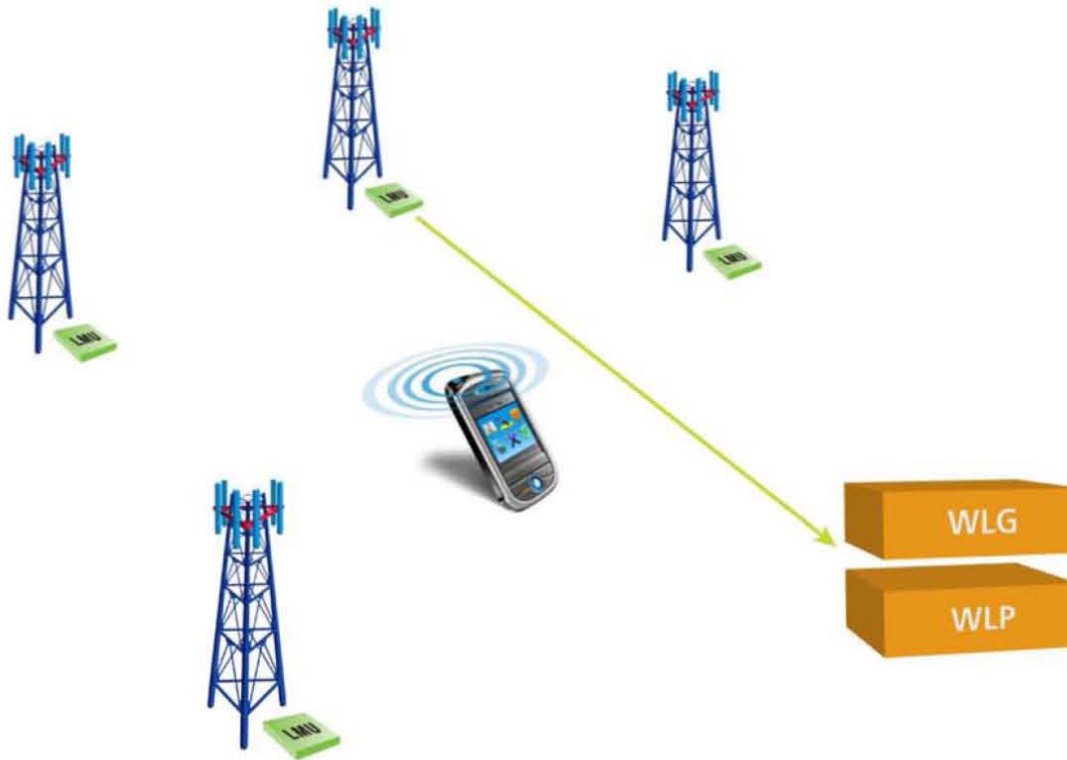
U-TDOA uses LMUs located at the base stations to calculate the time difference measurements used to determine the location of the mobile phone

How Does U-TDOA Work?



The operator's network makes a location request to the Wireless Location Gateway (WLG), which routes the request along the mobile phone's channel assignment to the Wireless Location Processor (WLP)

How Does U-TDOA Work?



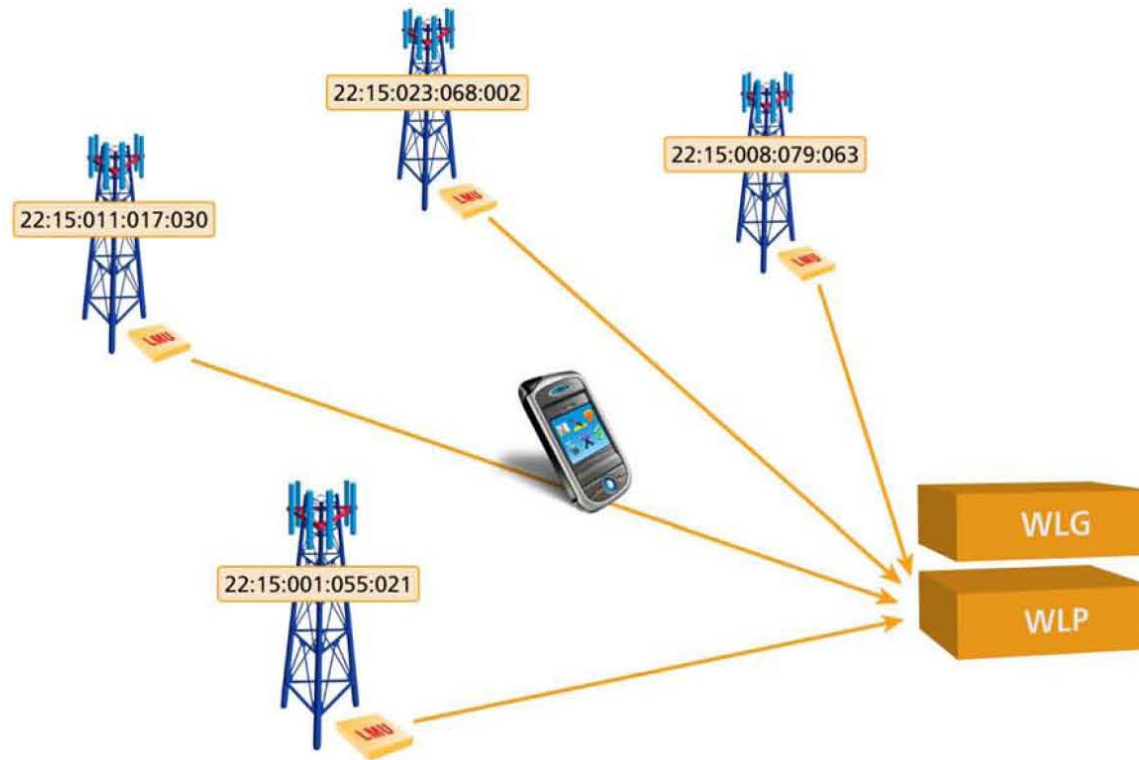
The request is transmitted through the wireless operator's network and then routed back to the WLG and the WLP

How Does U-TDOA Work?



The WLP instructs the LMUs to listen for a signal

How Does U-TDOA Work?



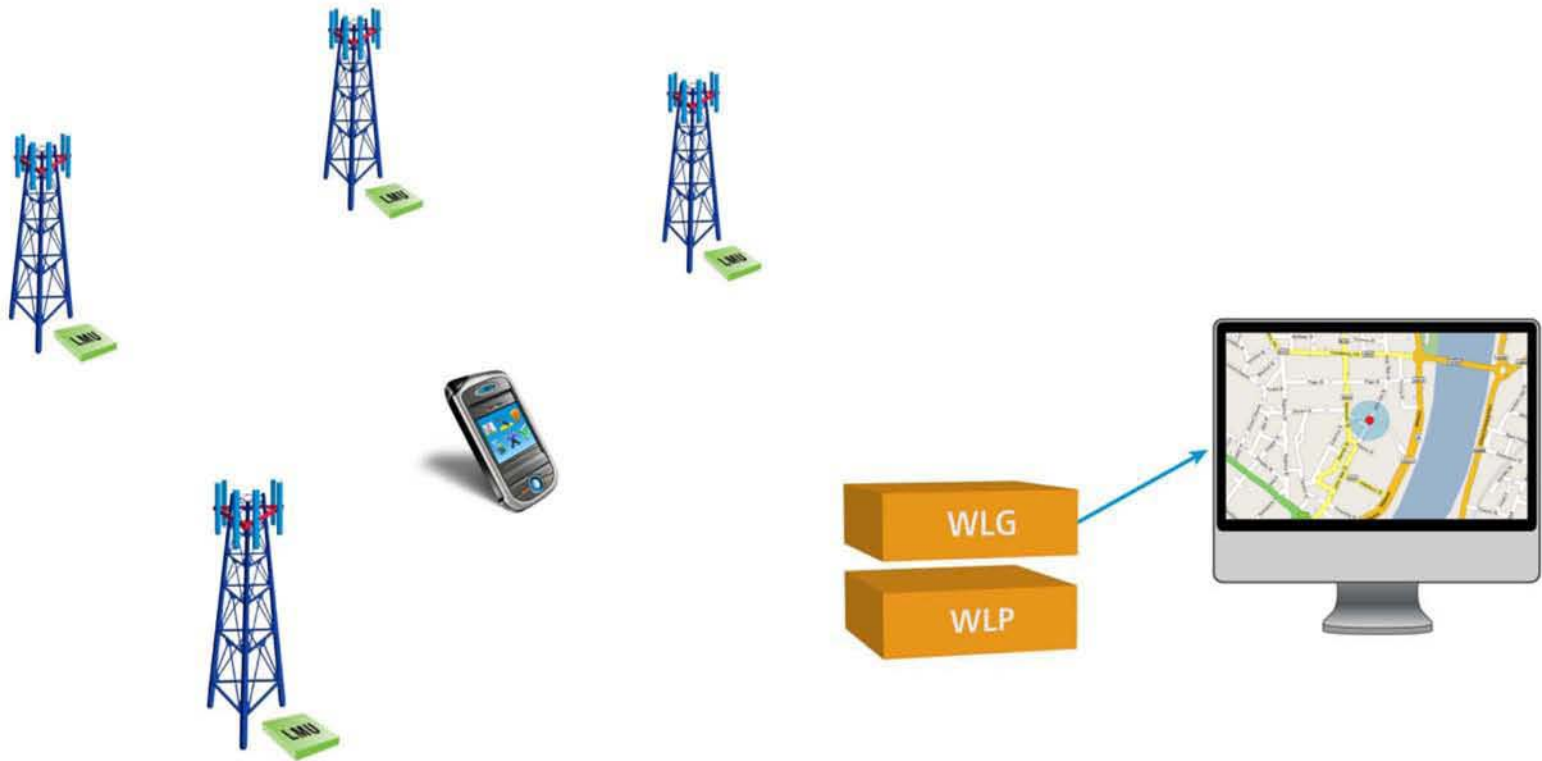
The LMUs measure the time difference of arrival of a mobile phone's signal and send the measurements to the WLP

How Does U-TDOA Work?



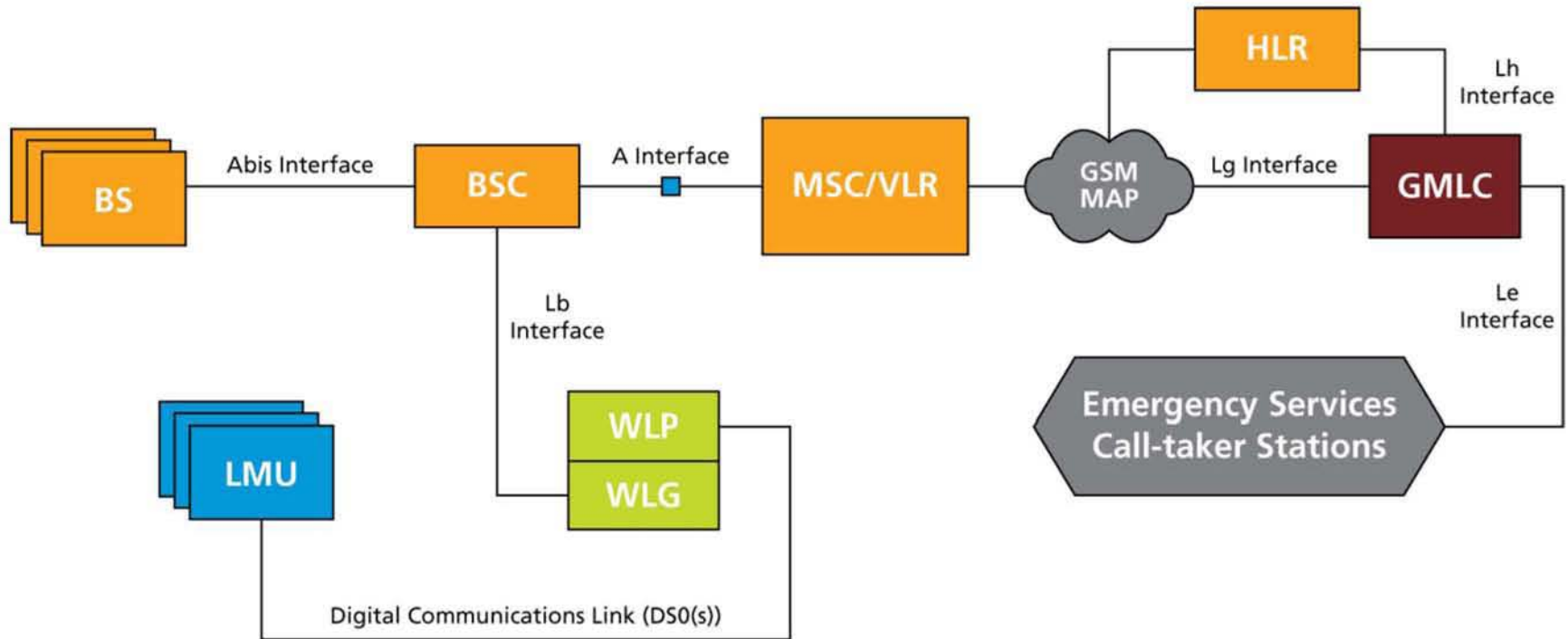
The WLP calculates the mobile phone's location by determining the difference in the times the signal arrived at multiple LMUs

How Does U-TDOA Work?

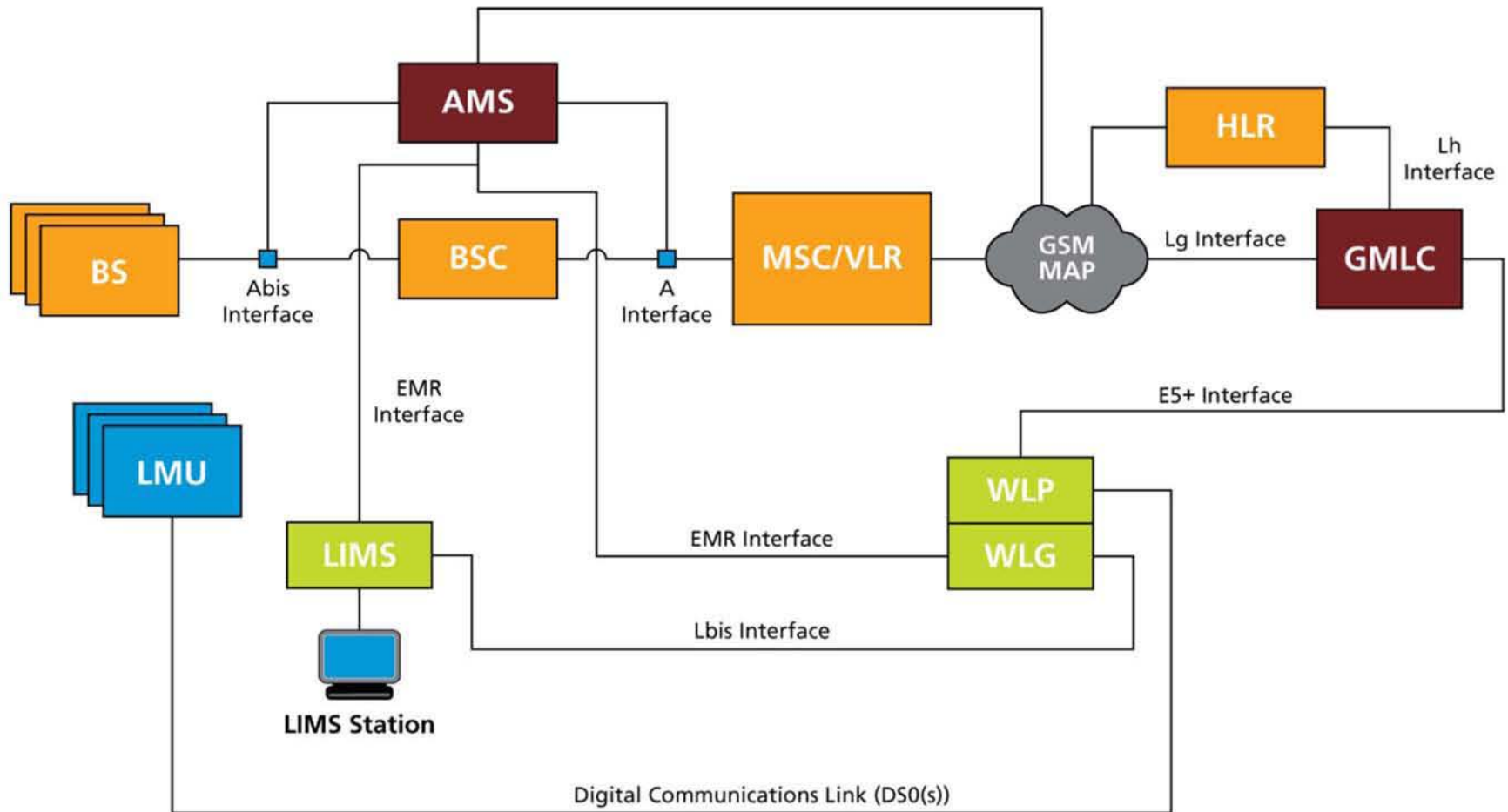


The WLG forwards the location to the operator's network or the requesting application

Emergency Call Location

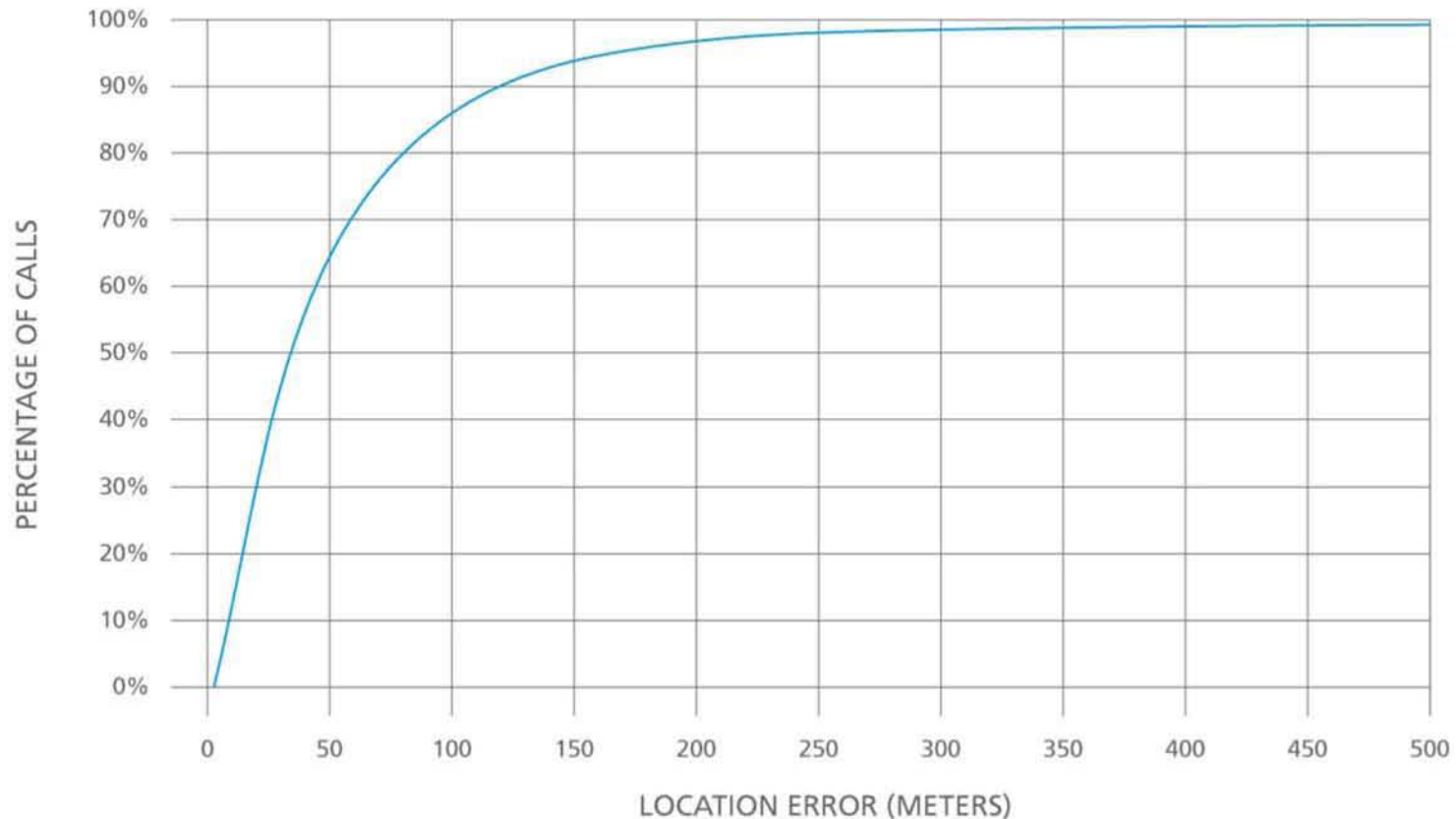


Security Solution



High Accuracy

MEASURED LOCATION ERROR CUMULATIVE DISTRIBUTIVE FUNCTION FOR GSM DEPLOYMENT



The more measurement points, the more accurate the location calculation
— TruePosition U-TDOA can use up to 32 measurement points

- Measured field performance shows U-TDOA to be 99.9% reliable
- Wireless network assigns RF resources to the mobile phone
 - U-TDOA receives the same RF resource assignment, so it is assured to receive and locate the correct mobile's signal

U-TDOA Can Locate All Mobile Devices



- Since U-TDOA is network-based, no additional hardware or software is needed for the mobile phone
- U-TDOA can locate phones on all air interfaces
- U-TDOA can locate phones in idle mode, which means that they are not currently making a voice call, or sending or receiving a text message
- U-TDOA can locate all legacy and future phones
- U-TDOA can locate all mobile phones that want to be located, as well as those that do not want to be located

U-TDOA Works in All Environments



- If a mobile phone can make or receive a call, then U-TDOA can locate it
- Phones work in many different environments: urban, suburban, rural, indoors, and outdoors
 - The base station and the phone must be able to hear each other to work
- U-TDOA works in all environments where three or more LMUs can hear the phone's signal
 - U-TDOA signal processing renders LMUs 10 to 1000 times more sensitive than base stations

TruePosition Overview

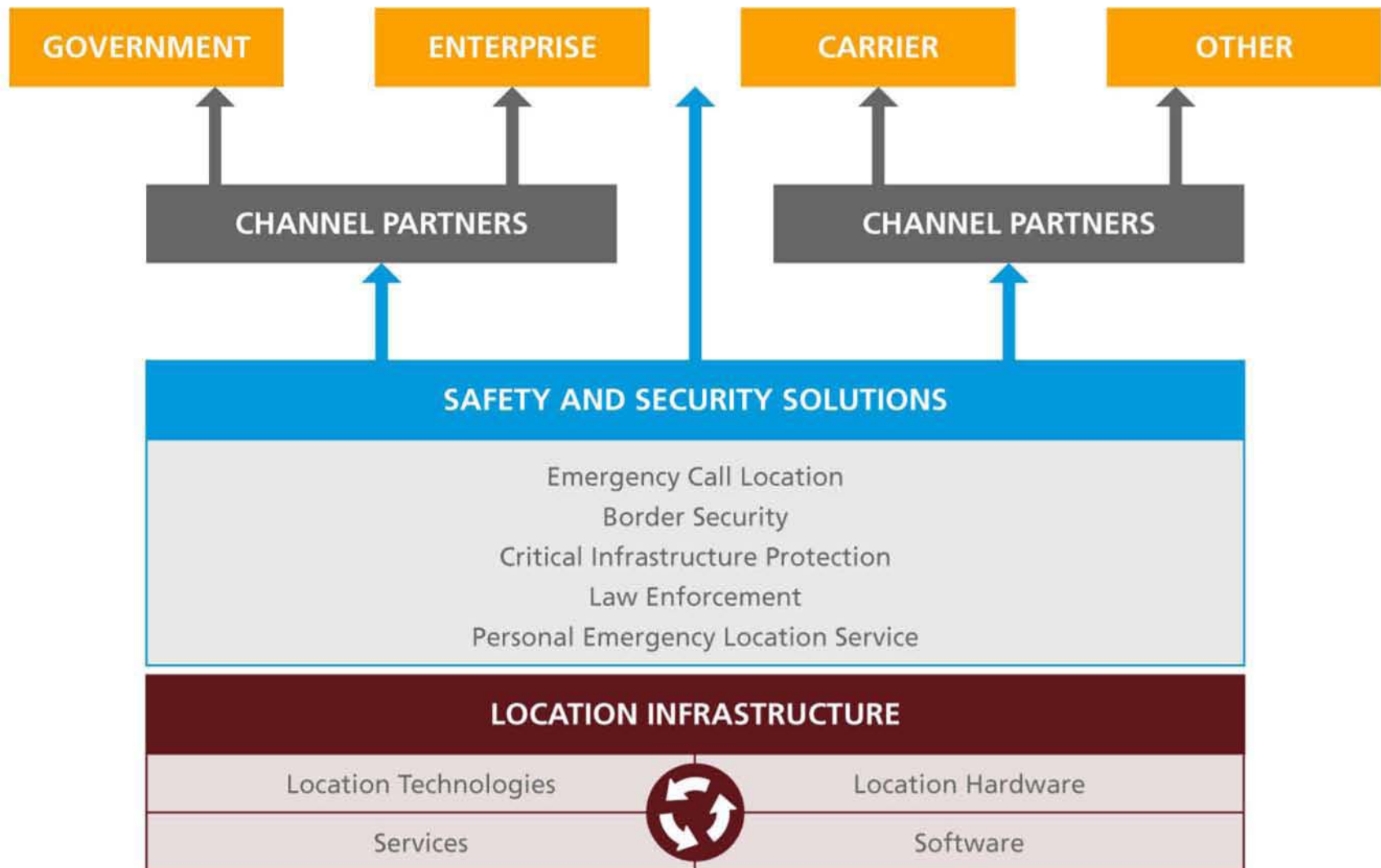


- A company solely dedicated to location-based technologies and solutions
 - 300+ employees worldwide
 - 140 patents
- Solution Focus – Location-based Safety and Security (LBSS)
- Market Focus – Government, Enterprise, Carriers
- HQ in US with regional presence in EMEA, Asia, Latin America
- A subsidiary of Liberty Media Corporation, a \$22 billion corporation



- TruePosition provides a comprehensive portfolio of technologies, products, and services to enable location-based safety and security solutions:
 - **Public Safety:** Emergency Call Location
 - **National Security:** Border Security, Critical Infrastructure Protection, Law Enforcement
 - **Personal Safety & Security:** Personal Emergency Location Service, Personal Asset Tracking
- Location Technologies
 - Uplink Time Difference of Arrival (U-TDOA)
 - Assisted GPS (A-GPS)
 - Enhanced Cell ID (E-CID)
- Core Products
 - TruePosition® Location Platform™ (TPLP™) – a location determination platform
 - TruePosition® Location Intelligence Management System™ (LIMS™) – a mobile event and location data retention and mining system
- Services
 - Consulting
 - Network design, maintenance, management
 - Systems integration, architecture design, project management

TruePosition LBSS Model



- Deployed Emergency Call Location solution — the largest location-based public safety solution in the world — to support FCC E9-1-1 mandate
- Customers are major GSM carriers in the United States, including AT&T Mobility and T-Mobile
- Powered by proprietary U-TDOA location technology
 - TruePosition® Location Measurement Units™ (LMUs™) installed at base stations
 - Calculates location based on the difference in the time it takes the uplink signal to reach multiple base stations
- Installed over 75,000 LMUs across the United States

U-TDOA Location Platform: Scalable, Robust, Proven



- Protects 100+ million citizens
- Locates 5+ million calls every month

Covered by the
TruePosition U-TDOA
Location Platform

There is no PSAP
requirement to locate
911 calls in that area

TruePosition LBSS Portfolio



TruePosition has broadly expanded its portfolio of solutions to address critical safety and security issues on a global basis

	PUBLIC	PERSONAL
SAFETY	Emergency Call Location (E-911 / E-112 / E-999)	Personal Emergency Location Service
SECURITY	National Security Border Security Critical Infrastructure Protection Law Enforcement	Personal Asset Tracking

- Unparalleled Experience and Expertise
 - Over 75,000 LMUs deployed
 - Locates more than 5 million calls per month
 - Largest company with a sole focus on location solutions
- Broadest Solution Portfolio
 - Emergency Call Location (E9-1-1/E112/E999)
 - National Security: Border Security, Critical Infrastructure Protection,
Law Enforcement
 - Personal Emergency Location Service
 - Personal Asset Tracking
- Superior Technology
 - U-TDOA is ideal for mission-critical safety and security solutions — it can locate any phone, in any environment, with high accuracy and reliability
 - Substantial intellectual properties protected by over 140 patents
 - Robust future-proof platform infrastructure

A Tragedy That Could Have Been Prevented

- Williams Lake, British Columbia
- An 18 year old male was walking home from a party and got lost
- He called 9-1-1 four times and pleaded for help
- They located his phone using CGI, but were only able to narrow the search area to several square kilometers
- The police conducted interviews with people at the party and searched for footprints in the snow



Ten hours later, police found the teen's body in the snow – dead from hypothermia.

A Tragedy That Could Have Been Prevented

- Sydney, Australia
- Three teenage males were hiking in the Blue Mountains, and one got separated
- With 100° F (37° C) heat, he was lost and nearing dehydration, so he dialed 0-0-0
- He was told that he needed to provide a street address in order to be located
- He named the trail he was last on and stated that he was near Mount Solitary
- He called 0-0-0 six more times and tried to provide more details about his location

Eight days later police found the teen's body slumped against a tree.



A Tragedy That Could Have Been Prevented

- Calgary, Canada
- 39 year old man was beaten up, thrown into a car, driven to the middle of nowhere and dumped
- He called 9-1-1 and reported that he was badly hurt and had no idea where he was
- Investigators could only trace the location of the call using CGI, so the search area was several square kilometers



Three days later, using dogs and a helicopter, the police found the man's body in a field of tall grass.

A Capsized Boater Rescued

- Corpus Christi, Texas
- A boat in the Gulf of Mexico capsized and the boater called "Mayday...Mayday..."
- Boater's mobile phone was not GPS-enabled
- Traditional wireless location technology (Cell ID) could only narrow the search area to a 1,280 square mile area
- The TruePosition U-TDOA Location Platform accurately located the boater and the United States Coast Guard sent a helicopter to the exact location



The boater was rescued within 40 minutes of his initial mayday call.

An Abduction Foiled, Criminal Captured

- Hamilton County, Ohio
- A female was abducted and locked in the trunk of the assailant's car
- Because the victim was in the trunk, A-GPS was not an option
- Without an active call, no cell site location information was possible
- The TruePosition U-TDOA Location Platform accurately located the vehicle, and calculated the direction and velocity



Police were able to set up a road block, and apprehend the suspect.

A Human Tragedy Prevented

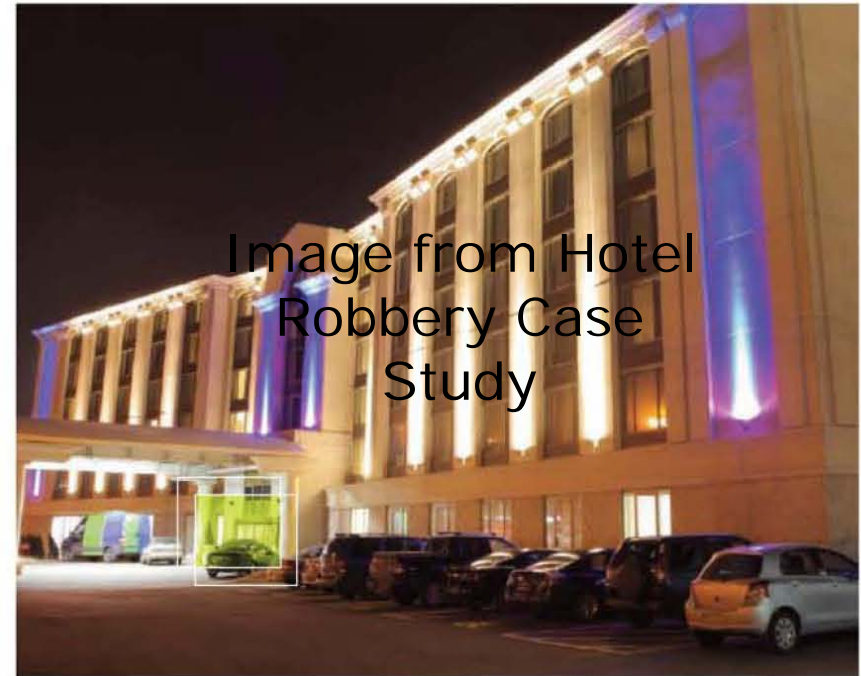
- Tallahassee, Florida
- Man called 9-1-1 and reported that his wife had taken their four-year old son in her car and was planning to kill the boy and herself
- Wife had been traveling by car for several hours – she did not contact anyone and no one knew her current location
- The TruePosition U-TDOA Location Platform was able to accurately locate her mobile phone, even though she was not actively using it



Mobile phone signal was relayed to police in Tennessee, 300 miles away. They found the woman and child, both unharmed.

Armed Robbery in Progress Interrupted

- Chester County, PA
- Two robbers confront a hotel's night manager with guns
- He dials 9-1-1 from his mobile phone then tosses the phone onto the ground, out of sight
- A-GPS would not have been likely to obtain an accurate location since the phone was indoors and obstructed
- The TruePosition U-TDOA Location Platform accurately provided the location of the mobile phone to the 9-1-1 responder, who dispatched police to the hotel



Police were able to stop the robbery in progress, saving the manager and guests from potential further harm.

Thank You

For more information, please visit trueposition.com